

What is claimed is:

1. A high pressure discharge lamp comprising:
  - a ceramic discharge tube with an inner space formed therein and end portions, said inner space being filled with an ionizable light-emitting material and a starter gas and an opening being formed within said end portion;
  - an electrode system provided within said inner space;
  - a sealing member comprising a ceramic or a cermet with a through hole formed therein, at least a part of said sealing member being fixed within said opening of said ceramic discharge tube; and
  - a metal member;
- wherein said lamp comprises a joining portion interposed between said metal member and said sealing member, and said joining portion comprises main phase contacting said metal member and an intermediate ceramic layer contacting said sealing member and existing between said sealing member and said main phase, said main phase comprising a porous bone structure with open pores and made of a sintered product of powder of a metal, and said main phase further comprising ceramic phase impregnated into said open pores in said porous bone structure.

2. The lamp of claim 1, wherein said intermediate ceramic layer and said impregnated ceramic phase contain a main component of said ceramic or cermet constituting said sealing member.

3. The lamp of claim 1, wherein said metal constituting said porous bone structure contains a main component of said metal constituting said metal member.

4. The lamp of claim 1, wherein said intermediate ceramic layer and said impregnated ceramic phase are made of ceramic materials comprising the same ingredient system.

5. The lamp of claim 1, wherein said porous bone structure has a porosity of open pores of not lower than 30% and not higher than 80%.

6. The lamp of claim 1, wherein each of said intermediate ceramic layer and said impregnated ceramic phase has a crystallinity of not lower than 80%.

7. The lamp of claim 1, wherein each of a ceramic constituting said intermediate ceramic layer and a ceramic constituting said impregnated ceramic

phase comprises one or more oxide selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Sc}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Ho}_2\text{O}_3$ ,  $\text{Tm}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{MoO}_2$  and  $\text{MoO}_3$ .

8. The lamp of claim 7, wherein each of a ceramic constituting said intermediate ceramic layer and a ceramic constituting said impregnated ceramic phase comprises three or more oxides selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Sc}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Ho}_2\text{O}_3$ ,  $\text{Tm}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{MoO}_2$  and  $\text{MoO}_3$ .

9. The lamp of claim 8, wherein each of a ceramic constituting said intermediate ceramic layer and a ceramic constituting said impregnated ceramic phase comprises  $\text{Dy}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$  and  $\text{SiO}_2$ .

10. The lamp of claim 8, wherein each ceramic has a content of  $\text{SiO}_2$  of not higher than 10 weight percent.

11. The lamp of claim 10, wherein each ceramic has a content of  $\text{SiO}_2$  of not lower than 5ppm.

12. The lamp of claim 1, wherein said metal member comprises one or more metal selected from the group consisting of molybdenum, tungsten, rhenium, niobium, tantalum and the alloys thereof.

13. The lamp of claim 12, wherein said metal member comprises one or more metal selected from the group consisting of molybdenum, tungsten, rhenium and the alloys thereof.

14. The lamp of claim 13, wherein said metal member comprises molybdenum or an alloy containing molybdenum.

15. The lamp of claim 1, wherein said sealing member comprises a ceramic selected from the group consisting of alumina, magnesia, yttria, lanthania and zirconia, or a cermet containing said ceramic.

16. The lamp of claim 15, wherein said sealing member comprises alumina or a cermet which contains alumina.

17. A high pressure discharge lamp comprising:  
a ceramic discharge tube with an inner space formed therein and end portions, said inner space being filled with an ionizable light-emitting material and a starter gas and an opening being formed within said end portion;  
an electrode system provided within said inner space; and  
a metal member;  
wherein said lamp comprises a joining portion interposed between said metal member and said discharge tube, and said joining portion comprises main

phase contacting said metal member and an intermediate ceramic layer contacting said discharge tube and existing between said discharge tube and said main phase, said main phase comprising a porous bone structure with open pores and made of a sintered product of powder of a metal, and said main phase further comprising ceramic phase impregnated into said open pores in said porous bone structure.

18. The lamp of claim 17, wherein said intermediate ceramic layer and said impregnated ceramic phase contain a main component of said ceramic constituting said discharge tube.

19. The lamp of claim 17, wherein said metal constituting said porous bone structure contains a main component of said metal constituting said metal member.

20. The lamp of claim 17, wherein said intermediate ceramic layer and said impregnated ceramic phase are made of ceramic materials comprising the same ingredient system.

21. The lamp of claim 17, wherein said porous bone structure has a porosity of open pores of not lower than 30% and not higher than 80%.

22. The lamp of claim 17, wherein each of said intermediate ceramic layer and said impregnated ceramic phase has a crystallinity of not lower than 80%.

23. The lamp of claim 17, wherein each of a ceramic constituting said intermediate ceramic layer and a ceramic constituting said impregnated ceramic phase comprises one or more oxide selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Sc}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Ho}_2\text{O}_3$ ,  $\text{Tm}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{MoO}_2$  and  $\text{MoO}_3$ .

24. The lamp of claim 23, wherein each of a ceramic constituting said intermediate ceramic layer and a ceramic constituting said impregnated ceramic phase comprises three or more oxides selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Sc}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Ho}_2\text{O}_3$ ,  $\text{Tm}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{MoO}_2$  and  $\text{MoO}_3$ .

25. The lamp of claim 24, wherein each of a ceramic constituting said intermediate ceramic layer and a ceramic constituting said impregnated ceramic phase comprises  $\text{Dy}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$  and  $\text{SiO}_2$ .

26. The lamp of claim 24, wherein each ceramic has a content of  $\text{SiO}_2$  of not higher than 10 weight percent.

27. The lamp of claim 26, wherein each ceramic has a content of  $\text{SiO}_2$  of not lower than 5 ppm.

28. The lamp of claim 17, wherein said metal member comprises one or more metal selected from the group consisting of molybdenum, tungsten, rhenium, niobium, tantalum and the alloys thereof.

29. The lamp of claim 28, wherein said metal member comprises one or more metal selected from the group consisting of molybdenum, tungsten, rhenium and the alloys thereof.

30. The lamp of claim 29, wherein said metal member comprises molybdenum or an alloy containing molybdenum.

31. The lamp of claim 17, wherein said discharge tube comprises a ceramic selected from the group consisting of alumina, magnesia, yttria, lanthania and zirconia.

32. The lamp of claim 17, wherein said discharge tube comprises alumina.